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THE FULLER ELECTRICAL COMPANY'S SYSTEM—Continued.

WOOD'S FOCUSING LAMP.

Fig. 11 is an exterior view of this lamp.

Fig. 12 is a perspective view of the interior construction, and Fig. 13 shows the method of insulation and feed-connections between the positive and negative carbon carriers. Fig. 14 shows a plan of the feed-connections. Fig. 15 shows an enlarged view of the feed-spindle for feeding the negative carbon, also the arrangement of the insulation. This lamp is constructed so as to operate singly, or in series with other standard single or duplex lamps. The improvements in this lamp are of an altogether novel description. Therefore it will be necessary, in order to thoroughly understand and appreciate them, to turn for a moment to a consideration of the lamps designed for the same purpose, that have preceded it: their defects, the means employed by their constructors to correct or remedy them; the reason for the failure of such attempts, and a description of the means which have been devised by Mr. Wood to perfect the mechanism. In the earlier forms of lamps, the positive carbon carrier, feeding by gravity, caused a train of clock-work to be set in motion, which wound up a chain insulated and connected with the negative carbon carrier in such a way as to cause the latter to be fed forward. The objection to this device was, that in case the negative carbon carrier was lifted or pulled up in cleaning the lamp, through carelessness, the chain was liable to quit the pulley, come in contact with other portions of the lamp, short-circuiting it, and in many instances melting the chain and ruining the mechanism. To obviate this evil, focusing lamps have been designed, with a cord to replace the chain. While this cord will not short-circuit the lamp, it leads to many mishaps and annoyances, as, for example, it is liable to be thrown off the pulleys or sheaves which guide it, by the careless lifting of the carbon holder, or to be broken by pressing down the negative carbon holder, in which case the strain necessary to move the positive carbon holder, which is about three times as heavy as the negative, and has to travel twice as far, is borne by the cord. As this strain is about six times greater than that required in its normal action, it is liable to, and often does, break. To remedy this defect, focusing lamps have been constructed with gear connections, the wheels being insulated from the spindles carrying them; but as quite a number of these had to be insulated, — the wheels being necessarily small—it was found that the required strength could not be attained, as the insulation was liable to shrink, and the plan was eventually abandoned.

Figs. 12, 13, 14, and 15 illustrate the method adopted to remedy these defects. As will be seen from Figs. 13 and 14, the carbon carriers of this lamp are geared together with positive connections, the pinions and wheels being fastened rigidly to the spindles. The insulation is accomplished by a disk of hard rubber, forming a coupling of unique construction, represented in Fig. 15.

It will be seen from this figure that the spindle (*a*) is cut in the middle, leaving a space of about an eighth of an inch. Each end of the spindle is fitted with a cross-arm (*b b'*), which is screwed to a hard rubber disc (*c*) in such a manner that the cross-arms (*b b'*) stand at right angles to one another on each side of the disc (*c*). The screws pass through the rubber and screw into the arms (*b b'*). This arrangement results in a perfect insulation, also leaving the spindle as strong as if it were in one continuous piece; the connections being such that they are not liable to be interfered with by shrinkage or change of temperature.

Figs. 13 and 14 show the position which this spindle occupies in the lamp; (*d*) represents the negative carbon carrier, which is insulated from the body of the lamp; (*e*) represents an insulated bearing, in which one end of the spindle (*a*) revolves—(*f*) is the positive carbon carrier, and (*g*) is a spindle which connects it with the spindle (*a*)—(*h h'*) are two gear wheels having a relative proportion of two to one. The two feed rods are so connected together as to move forward in their respective proportions, the whole being so rigid in its construction that either carbon carrier can be forced in either direction without in any way endangering the operation of the feed mechanism, or injuring the insulation. The direction which the current takes in passing through this lamp is similar to that described in Fig. 7. Referring to Figs. 11 and 12, it will be seen that the base of this lamp is so constructed as to provide an adjustment for raising or lowering the whole mechanism of the lamp; in order to always maintain the light in the focus of the reflector, the body of the lamp rests upon the tube (*j*), on which the knurled nut (*i*) turns, this nut being turned to the left to raise, and to the right to lower the lamp. This tube (*j*) slides into a tube (*k*) nd is held in position by the screw (*l*) which,

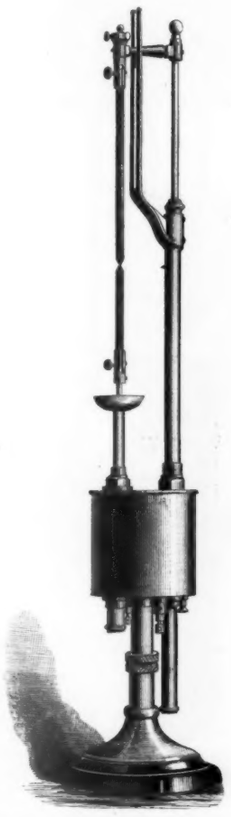

FIG. 11.—WOOD'S FOCUSING LAMP.

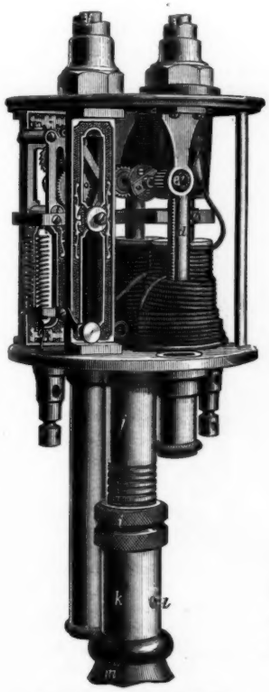

FIG. 12.—INTERIOR VIEW.

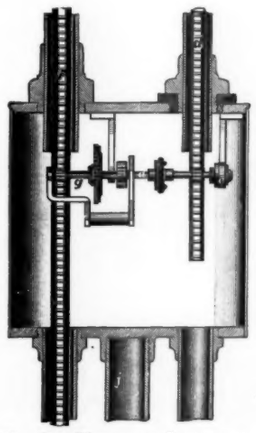

FIG. 13.—METHOD OF INSULATION.

FIG. 14.—FEED-CONNECTIONS.

FIG. 15.—VIEW OF COUPLING.

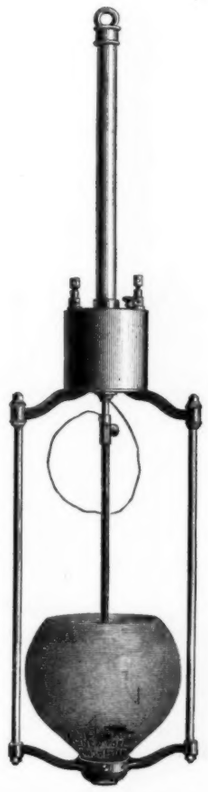

FIG. 16.—EXTERIOR VIEW.

fits into a slot in the tube (*j*). The nut (*i*) is held in its position by a screw not shown, the end of which fits into a groove around the tube (*k*), which sets upon the ornamental base (*m*).

WOOD'S SEMI-INCANDESCENT LAMP.

Fig. 16 represents the exterior view of this lamp.

Fig. 17 is a perspective view of the interior construction, and Fig. 18 a diagram showing the direction taken by the current in passing through the lamp; also the action of the automatic cut-out which is operated by repulsion. This lamp was designed by Mr. Wood to be used in series with the standard arc lamps, or for separate use where a greater distribution of light is desired, and the volume of light produced by the standard lamp is not required. It is of low resistance—about two ohms—the standard lamp being about four and a half ohms, and produces, of course, a considerably smaller light. About twice as many of these lamps are operated from the same machine as of lamps of standard illuminating power.

The operation of this lamp may be described as follows: Referring to Fig. 18, it

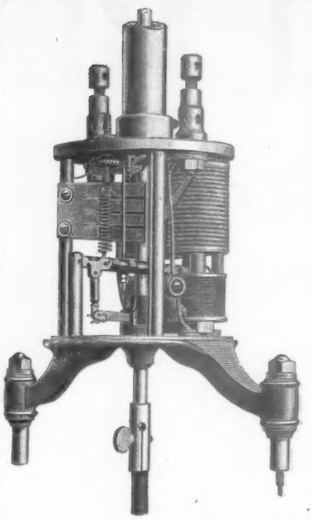

FIG. 17.—ARRANGEMENT OF PARTS.

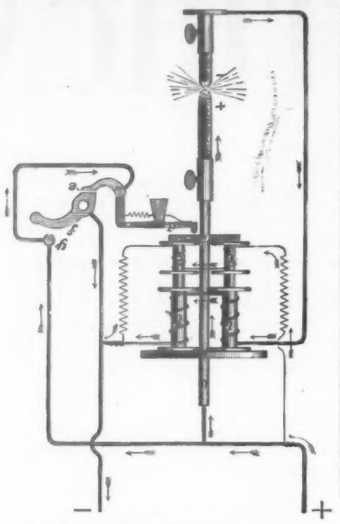

FIG. 18.—DIRECTION OF CURRENTS.

wrought and cast-iron, so as to combine strength and lightness, and is designed with a view of obstructing the light as little as possible. It is covered with a hood used as a protection against wind and weather. The lamp is reached for the purpose of renewing carbons, etc, by means of steps, as shown in the accompanying cut. The lowest of these steps is usually placed about seven feet above the sidewalk. As with all lamps of this company, special attention is given to safety by introducing the line wires to the lamp on the upper portion of the frame, thus rendering the wires less liable to damage than by the ordinary method, and also enabling the attendant, should he have occasion to handle the lamp while the current is flowing, to be in little danger of shock.

MARINE PROJECTOR.—FIG. 22.

The marine projector is designed to be used in connection with the focusing lamp in cases where it is desired to throw the light in different directions, and is designed for

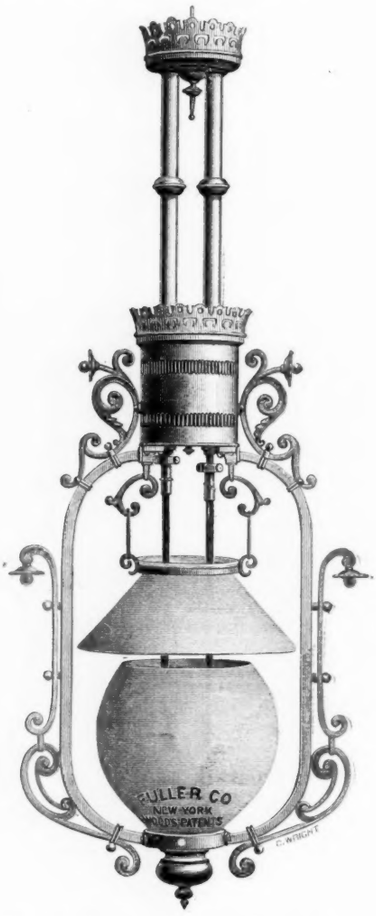

FIG. 19.—ORNAMENTAL LAMP, TWO CARBONS.

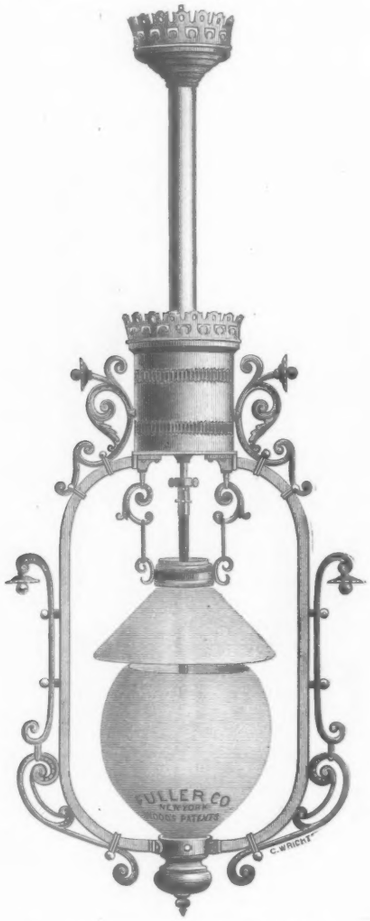

FIG. 20.—ORNAMENTAL LAMP, ONE CARBON.

FIG. 21.—STREET LAMP.

will be seen that the current enters at the upper left hand corner at the wire marked + following the direction of the arrows down the rod (*a*) to the positive carbon, thence to the negative carbon, and back through the magnets (*bb'*) which are in the main circuit, and thence out through the wire marked — to the generator, or to the next lamp in series. The current divides itself between the resistance of the arc and the resistance of the shunt magnet coils (*c c*). These coils are wound in a direction so as to set up a polarity in the cores similar to that of the current flowing through the magnets (*bb'*). The action is as follows: Imagine the carbons in contact, and the current from any source sent through the lamp; after passing through the carbons it will pass through the solenoid coils (*bb'*) which are in the main circuit, causing them to attract the shunt magnet (*c'*), which is of a horse shoe form, and acts as an armature for the main solenoids (*bb'*). This action produces the separation. As the carbons are consumed a greater proportion of the current will be diverted through the shunt magnet coils (*cc*), in a direction tending to neutralize the magnetic influence of the solenoids (*bb'*) allowing the magnet (*c*) to gravitate downwards, to produce the feed of the carbons. In case the carbons should fail to feed and the arc become abnormally long, a still greater proportion of current will be diverted through the shunt magnet coils (*cc*), which will polarize the cores similar to the polarity of the current flowing through the solenoids (*bb'*), and cause them to repel or force out the magnet armature (*c*). If the lamp then fails to feed, they will continue to force out the armature which will come in contact with the lever (*d*) tripping it and allowing the contact points (*e*) to be automatically closed, switching the light out of circuit. When it is desired to switch the light out by hand, all that is required is to move the hand switch (*f*) so that it will close contact with the knob (*g*). The reverse operation will again re-establish the arc. The precise arrangement of parts in this lamp is shown in Fig. 17.

Single and Duplex Ornamental Lamps.

In order to meet the demand for ornamental lamps for hanging in large parlors, dining halls, picture galleries, music halls, theaters and stores, the Fuller Company have had artistic designs made for their lamps, as will be seen by the above cuts, Figs. 19 and 20.

STREET LAMP.—FIG. 21.

The frame of this, designed to hold a duplex lamp, is insulated and amply protected from the weather. This lamp will burn for about sixteen hours. The frame is made of use on vessels navigating rivers, lakes and harbors. It is provided with a hand-wheel which engages into a sector or worm-wheel, by the use of which the light is thrown up or down, or retained in any position desired. It also swings on a bolt in the center of the uprights, so as to throw the light in any required direction laterally. This projector is arranged with a camera in each trunnion, on which an image of the carbon points is reflected, so that when the light is seen directly in the center of the object-lens the carbons are in focus.

This company also manufactures a reflector for use in connection with its focusing lamp, adapted for locomotives and steamboat headlights, and for other purposes requiring a strong reflected light. It is not intended to be used as a movable light, as is the case with the projector, but can be so fitted up when required. Fig. 23.

THE INDICATOR AND ALARM.

Fig. 24 represents an exterior view of this apparatus.

Fig. 25 represents the interior construction.

This apparatus is designed for use where the lights are operated from central stations, so as to enable the users to turn them on or off at pleasure.

The operation of this may be described as follows :

Consider the current as entering at the binding-post (*a*) passing through the magnet coils (*b b*), thence to the stud (*c*), thence around the magnet coils (*d d*), and back through the frame-work of the instrument to the binding-post (*e*) off through the lights, and thence to the generator. It will now be seen that the current, in passing through the magnet coils (*b b*) and (*d d*), will strongly magnetize their cores. The cores of the magnet (*b b*) have polar extremities formed with eccentric faces, so that they tend to attract the armature, carrying with it the pointer in a direction so as to produce a deflection of 45° on the scale. The armature (*f*) of the bell is held against a stop (*g*) by a spring (*h*), which balances the attractive force of the magnet when the current flowing through the coils (*d d*), is normal.

Let us assume that this indicator is connected in the engine-room with an electric light circuit, where several lamps are in operation, and the current flowing through the instrument is the standard current necessary for this number of lights. Then in case of the extinguishment of one or more of the lamps, the resistance of the circuit will be diminished, the quantity of current increased, and the pointer of the indicator will move past its normal position due to an increased attraction of the magnets (*b b*). The magnets (*d d*) will also increase in strength, overbalancing the spring (*h*) which holds the armature against the stop-screw (*g*), attracting the armature and striking the bell. When the bell is struck the contact points (*i*) are closed, which shunts a portion of the current from the magnet coils (*d d*), causing it to release the armature (*f*). This operation will be repeated until the engineer in charge sets the regulator on the machine so as to reduce the current.

In case lights are turned on, the resistance of the circuit will be increased, the pointer will then fall below its normal position, the engineer will then set the regulator so as to supply the lamps with more current until the pointer comes back to its original position. In case of a short circuit occurring on the line, so as to cut out several lamps, the bell will ring violently, and continue to do so until the extra current required for those lamps has been turned off An important advantage of this device over others designed to serve the same purpose, is, that it is operated by the same current as that which operates the lamps, and does not require the aid of a local battery.

ELECTRIC MOTOR.

Fig. 26 represents an electric motor. The general appearance of this motor is similar to that of the large size generator, with the exception that it has no current-regulator, and that the binding-posts are on the front instead of at the back, as in the larger machines. This is also used to produce a single light of great illuminating power, it being especially designed for currents of great quantity and low electromotive force.

STANDARD FOR GENERATOR.

It is sometimes important to locate a machine so as to be able to stop its running by shifting the belt, without stopping the power, where it is impracticable to use a loose pulley on the shafting. To serve this purpose, this company manufactures a standard to which a loose pulley is attached, as shown in the above cut. It is designed to be bolted back of the machine, so as to hold the loose pulley concentric with the driving pulley of the machine. It is fitted with a stationary oil-cup, so arranged as to allow the bearing of the loose pulley to be oiled while in motion.

A lady, writing to a Western journal of the recent exposition at Louisville, gives the following glowing description of the scene at night: "If you approach it by night, you see strings of electric lights upon the streets, like luminous bells; it seems their twinkle must tinkle into joyous chimes, so fairylike and restless and gay they hang. Besides these Edison lights, all through the park the Brush lights glow like great animated lilies in the air. As the water-lily sways on the stream, and is hidden sometimes by the swelling waves, so the current of the air seems to bend and break over this great bed of electric flowers. 'They are gone,' you say. 'No, there they are, firm and brilliant as ever.' But at the next gust they are almost extinguished. Where do they hide in those ether currents, which our eyes cannot penetrate, only to come up again with the graceful rhythms of the lily-bell?"

On the Electrical Resistance of the Human Body.

Nature publishes an abstract of a paper read before the British Association at Southport, by W. H. Stone, M.A., F.R.C.P., in which the writer, after premising that hitherto electricity in its application to the human body had not come up to expectations reasonable in the case of so powerful a force, and that it was evidently still in an embryonic state, mentioned some examples of the conflicting and contradictory statements made by different authorities as to its electrical resistance. These varied from 13,000 to 2,875 ohms and less. He believed it was enormously overstated, and had for this reason applied himself to make some more accurate determinations. He was at once met by three obstacles:—(1) The difficulty of making good contact through the skin of a living man. (2) The limitation of the amount of current by pain, and by the fact that the rapid opening and closing of strong circuits produced a tetanic state of muscle. (3) The fact that the human body is an easy electrolyte, almost immediately furnishing currents of polarization.

As regards (1), the axiomatic statement seemed to be that the poles must be infinitely large compared with the current they had to conduct. This condition he had attempted to fulfill in five different ways, two at least of which were successful; either by immersing the feet and hands in baths of brine in contact with an electrode of amalgamated lead or zinc of from fifty to a hundred square inches surface, or by soaking these extremities in brine, and then wrapping a strip of flexible lead two feet long by two inches wide about them, after the fashion of a surgical spiral bandage. The fact that the skin resistance was thus reduced to zero was proved to demonstration by an observation, from which it appeared that the resistance of a corpse, treated with the spiral leaden bandages from foot to foot was 1,150 ohms, and with solid silver conductors thrust three inches deep into the plantar muscles was actually 50 ohms more.

Under the heading of contacts it was essential to determine definite anatomical points from which the measurements should start, and which readily admitted of linear verification. Such points existed in the prominence of the ulna at the inner side of the wrist, and the lower edge of the external malleolus at the ankle. The shortest course traversed by the current between these two points had been measured to a quarter of an inch.

There were three principal directions in which determinations had been made :

1. From hand to hand.
2. From foot to foot.
3. From hand to foot.

No. 1 was much the same as the height of the subject, and was not liable to great variation.

No. 2 varied more, since the difference between very tall and shorter men lies chiefly in the legs.

No. 3 was perhaps the best test of the average conductivity of the body, since looped currents were sure to traverse the whole trunk, and even caused motor disturbance in the extremities not included in the circuit.

Three such observations were given, including one on a man of the exceptional height of nearly eight feet.

As regards pain, it was noted that the E. M. F. used varied from three to ten bichromate cells of 1.8 volts each. Even the first was occasionally complained of, thus incidentally showing the goodness of the contact obtained. In morbid conditions, such as that termed myxœdema, the E. M. F. of ten cells or eighteen volts through a resistance of only 1,260 ohms was easily borne, and indeed hardly felt. The third difficulty, that namely of electrolysis, was the most serious; indeed the particular metal of which the electrodes were made sank into insignificance compared with the rapid and vigorous polarization of the moist tissues of the body itself. A rotating commutator on Wheatstone's plan, and afterwards a metronomic instrument, by which

FIG. 22.—MARINE PROJECTOR.

FIG. 23.—REFLECTOR FOR FOCUSING LAMP.

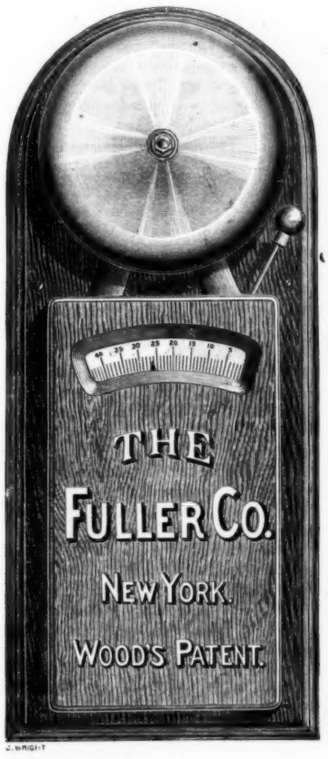

FIG. 24.—EXTERIOR VIEW INDICATOR AND ALARM.

the periods of alternation could be varied, were first used, but with only partial success. A more delicate mode of discharging was found in the use of an ordinary commutator key worked like a piano with the index and middle fingers of the left hand; a double contact key, putting battery and galvanometer successively in circuit, being beneath the right index finger. The left keys being first depressed alternately, the right key produced a double deflection, while the bridge resistance was too low, which was replaced by an opposite double deflection when it was intentionally made too high. By watching the galvanometer a point was easily found where it ceased to "throw," and then three successive contacts in either direction were taken to determine resistance. In spite of all precautions, the second measurement was sometimes in excess of the first, owing to a polarization-current assisting the battery. This, however, never amounted to more than about five ohms, and was easily allowed for. Between each set of observations a short-circuit key, inserted outside the bridge, was closed for at least a minute, so as to discharge patient, bath, and electrodes.

The measurement was then repeated with inverted current, and the mean taken.

One set of examples out of many was read to the meeting. Three men of very different heights were tested according to the following table:

	Ht.	Wt.	Ulna mal'us.	to ft.	Foot to hd.	Foot
	ft.in.	st.lb.	ft.in.		ft.in.	
1. Mr. Todd	5 6	7 13	5 9¼	.945	.1,320	
2. Mr. Shakel	6 3	13 0	7 0	.930	.1,027	
3. Hungarian Giant	7 8		3 7	.930	.1,032.5	

Two of these were students at St. Thomas's Hospital; the third an Austrian now exhibiting at the Aquarium, and kindly lent to the writer for examination. All the three were singularly strong, healthy, well-proportioned men, of active athletic habits. An interesting illustration of physiological laws here incidentally cropped out, showing that, in the normal human body considered as a machine, as is the length of the osseous levers so is the sectional area of the motor muscles. This in the present instance results in an almost complete identity of the electrical resistance, increased length being very fairly balanced by increased sectional area in the conductor. A good test of morbid leanness or fatness might probably be founded on this identity.

A few words only were given to the variations of human resistance in disease and with alteration of temperature.

As regards the former, six cases of hemiplegia were cited; three on the right and three on the left side of the body, in all of which the paralyzed was found less resistant than the healthy side, in amounts varying from 120 to 730 ohms. The only case which differed from this rule was that of a worker in copper, from whose secretions three milligrams of metallic copper had been extracted, where the cupreous impregnation obviously modified the general resistance of the body, as the writer had found it to do in the case of lead and mercury also.

A confirmation of the view already expressed by the writer of the paper, that the human body follows the law of solid rather than that of fluid conductors under changes of temperature, had occurred in the instance first quoted, where the occurrence of dropsical effusion in the lower extremities permanently reduced the resistance from the values originally given, the lowest of which was 2,300, to 750 ohms.

Bleaching with Salt by Electricity.

Our esteemed contemporary, the *Textile Record*, says, upon this subject, that Labarrque's solution, or sodic hypochlorite, is one of the most perfect bleaching agents known. It is usually made by adding a solution of sodic carbonate to one of chlorinated lime or bleaching powder. As thus made, it is not pure, for the chlorinated lime, being a mixture of calcic chloride and calcic hypochlorite, the solution which results from its decomposition by sodic carbonate will be a mixture of sodic chloride and sodic hypochloride. The last-named possesses bleaching properties, and in a two-fold degree. Composed of soda and hypochlorous acid (ClO), it contains in a state of exceedingly unstable combination the two great bleaching agents, chlorine and oxygen. By its decomposition these are liberated, and as, when first set free—that is to say, when in their nascent state—chemical agents are most potential, the conditions under which the two elements exist are the most favorable possible for the effective exercise of their discolorizing qualities on vegetable fiber.

Now, it is for the purpose of securing these conditions that the aid of electricity is invoked. That this subtle agent has the power of decomposing metallic salts has been known for nearly a century. The novelty lies in the application of it to the decomposition of a solution of common salt, in the presence of the fiber or goods to be bleached. This solution contains, of course, the elements of water, oxygen and hydrogen, and the elements of salt, chlorine and sodium. The effect of a passage of a current of electricity through the solution is to set all these elements free, and the fiber is bleached by the combined action of the oxygen and chlorine. The old forms of galvanic battery were but illy adapted to do this work of electrolysis. The modern generator, the dynamo, unites power and economy, and not until it had come into use was the process we are about to describe made industrially practicable.

According to our esteemed contemporary, *Le Moniteur de la Teinture*, the apparatus invented and put in operation by Messrs. Naudin & Schneider, of Paris, is giving satisfaction. It consists of a reservoir called the electrolyzer, and of a vat, both of which can be tightly closed. The electrolyzer is so placed that its bottom is on a level with the cover of the vat. It is provided with a safety valve, and from its top a pipe passes to the upper part of the vat containing the materials to be bleached. A pipe passes from the bottom of the vat to the bottom of the electrolyzer, and by means of a pump the liquid in the lower is forced into the upper vessel. By properly arranging poles or electrodes and wires the electrolyzer can be put in circuit.

The following is the method of operating: The vat containing the fiber or cloth to be bleached is, as well as the electrolyzer, filled with a solution of common salt. The solution in the latter is submitted to electrolysis. Portions of both the water and the salt undergo decomposition. The oxygen of the one unites with the chlorine of the other, producing hypochlorous acid, which unites with the sodium, forming the sodic hypochlorite.

The extent to which the decomposition has gone on is ascertained from time to time by drawing off a small portion of the solution, and determining its bleaching effect upon indigo test liquor. When the decomposition has proceeded far enough, the pump is set in motion, by which the solution of common salt from the bottom of the vat is forced into the bottom of the electrolyzer, raising the level of the solution of hypochlorite in the latter, which flows out of the upper pipe into the vat and upon the top of the mass of fiber or tissue contained therein. The slow and steady transfer of the solution of salt in the vat to the electrolyzer, there to be more or less decomposed and converted into hypochlorite, which, thus freshly prepared, falls upon and, so to speak, filters through the matters to be bleached, altogether comprise a series of operations which seem to possess rare advantages. Among these the uniformity in the strength of the bleach will not be overlooked.

Nor should it be forgotten that other chlorides than common salt, as well as alkaline iodides and bromides contained in sea water, may be transformed by electrolysis into bleaching salts, and the suggestion as to how far that water, more or less concentrated, can be used in the process may well be ascertained.

The safety valve mounted on the electrolyzer, and designed to permit the escape of the free hydrogen produced, would also permit that of portions of the chlorine, and thus occasion loss and inconvenience, but for a neat and simple attachment. This consists of a small vessel containing an alkaline solution which contains the chlorine, thus separating it from the hydrogen with which it was mingled, and preventing its escape.

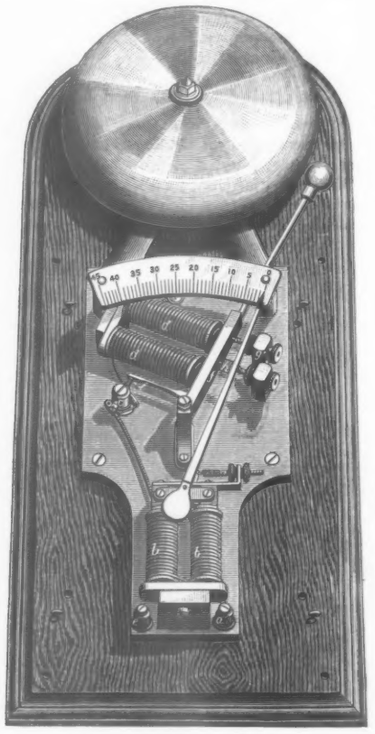

Fig. 25.—Interior Construction of the Indicator and Alarm.

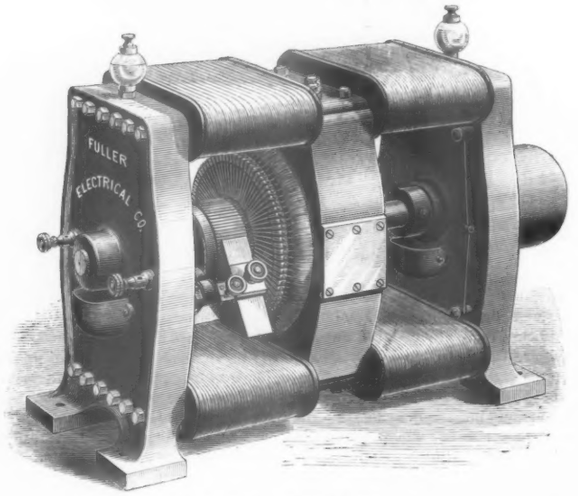

Fig. 26.—Electric Motor.

Fig. 27.—Standard for Generator.

Report on Secondary Batteries.

[Report presented by MM. D. Monnier and E. Guitton to the syndicate of "La Métropolitaine Electrique," on the application of Faure-Sellon-Volckmar accumulators to incandescence electric lighting and to the propulsion of tram-cars.]

1. The Rendering of the Accumulators.

Accumulators store up, by chemical action, the electrical energy furnished to them by an external source, and then reproduce this energy in the form of an electrical current by virtue of chemical reaction.

This double transformation cannot be realized without a loss of work which it is desirable to estimate as accurately as possible.

The rendering of accumulators is the relation between the quantity of electrical energy furnished to the accumulator and the work which it will furnish in discharging.

This coefficient has been determined experimentally with a battery of 10 elements of accumulators of the type 17.5 k., which were sent to us charged.

The battery was discharged, then recharged and discharged four times alternately.

The four charges furnished 1,761,816

coulombs of electricity, with a total energy of 4,040,000 kilogram-meters.

The four corresponding discharges furnished 1,485,966 coulombs of electricity, with a total energy of 2,526,630 kilogram-meters.

The final discharge being stopped at the moment when the battery was in the same electrical condition as at the commencement of the first charge, the sum of the results furnished by the four successive discharges represents the actual rendering of the four corresponding charges.

The preceding figures show therefore :

1. That the total quantity of electricity returned in discharging is equal to 84.34 per cent. of that which was consumed for charging ; this is the *rendering in quantity*.

2. That the total amount of energy given off in discharging is equal to 62.44 per cent. of that which was consumed for charging ; this is the *rendering in work*, the most important from a practical point of view.

2. THE CAPACITY OF ACCUMULATORS.

The capacity of an accumulator is measured by the total work which it will furnish after having been completely charged ; but, practically, accumulators are never completely discharged, because the last few hours of a complete discharge only furnish a very small quantity of energy which it would be difficult to utilize. Besides, the energy which the accumulator still possesses is not lost ; it constitutes a permanent reserve necessary for the regular working of the apparatus.

The practical capacity of an accumulator will therefore be lower than its actual capacity ; it will be measured by the work which the accumulator will furnish usefully in continuous operation before being re-charged. It is thus that we found that our battery of 10 elements, containing 175 kilogrammes of useful material, would furnish in continuous operation a total work of 670,752 kilogrammeters, or 2.4843 H. P.-hour, which corresponds with 14.2 H. P.-hour per ton of useful material, or 70 kilogrammes per H.P.-hour.

The battery gave an average of 14.76 ampères or 0.84 ampères per kilogramme of useful material in one of the series.

The capacity deduced from the preceding data is not absolute, and it is probable that, by improvements in the construction of the accumulators, the weight of metal required per horse-power hour will be considerably reduced.

The figure given above applies to continuous working, as, for instance, for lighting exclusively by a battery of accumulators ; if the work was not continuous, or if the accumulators were employed merely as a regulator upon a circuit supplied by a dynamo, the practical capacity would be greater.

We would remark that, in most cases, the weight of the accumulators employed is intentionally increased rather than diminished; for if, on theone hand, it entails an increase of the capital invested, on the other the apparatus will wear better.

The figure given above should, therefore, be considered as a simple indication referring to a special case, and it is industrial experiment which must determine, for each kind of application, the most advantageous relation between the weight of the accumulator and the work to be done.

3. THE DURABILITY OF ACCUMULATORS.

It is evident that the durability of accumulators depends on the quantity of energy which they have to store up. Experimental data on this important point is wanting, but we think that it is possible to estimate accurately enough the maximum limit of use of accumulators.

It would be out of the question to begin here a detailed discussion of the various chemical reactions which take place in an accumulator during the period of charge and discharge, and we will confine ourselves to mentioning that the gradual alteration in the accumulator is due to parasitic reactions which absorb, as pure loss, a portion of the work supplied, and transform the positive electrode by degrees into bioxide of lead, so that in time the positive plates become inert, and must be replaced whilst the negative electrode is not sensibly changed.

To transform by electrolysis 1 kilogramme of lead into bioxide of lead, it requires 1,855,000 coulombs of electricity.

To transform in the same manner 1 kilogramme of minium it requires 565,600 coulombs of electricity.

The plates of the positive electrode are formed of two parts of lead, one part of minium.

Therefore, in order to completely peroxydize 1 kilogramme of positive electrode, it would require 1,425,200 coulombs of electricity.

Adopting the rendering in quantity already found (84.34 per cent.), and admitting that the quantity of electricity lost in the discharge is entirely consumed in oxydizing the positive electrode, we see that when the accumulator has received 9,100,000 coulombs of electricity, 1 kilogramme of positive electrode will have been rendered useless. The work furnished by the accumulator during this time will have been 4.5 H. P. hours.

But experiment shows that the loss of electricity is caused partly because the gases resulting from the electrolysis are not completely fixed by the electrodes ; the consumption of the positive electrode will be, therefore, in reality, slower than the preceding calculation indicates. As this electrode would be rendered useless before the peroxydation was complete, we will admit that, in practice, the positive electrode will act as if the consumption was 250 grammes of useful material per horse-power hour disposable from the accumulators.

4. MOTIVE POWER REQUIRED FOR CHARGING ACCUMULATORS.

Accumulators are charged by means of shunt-dynamos, of which the dimensions and winding should be suitable for this special work. With a Siemens S D_0 machine meeting these requirements, we obtain at the terminals of the machine 85 per cent. of the total electrical work.

This total electrical work being itself 0.88 of the motive power developed, we see that the electric energy disposable at the terminals of the dynamo represents 74.80 of the motive power.

The accumulators having, as we have already shown, a rendering in electrical work of 62.44 per cent., their mechanical rendering will be 46.5 per cent.—that is to say, that 1,000 kilogrammeters of work developed by the motor would be equivalent to 465 kilogrammeters disposable from the accumulators.—*London Electrical Review.*

An interesting acoustic apparatus, called the "electro-magnetophone," was shown at the Munich electrical exhibition. The instrument consists of a tin disk fixed at the bottom of a hollow cone, and having above it an electro-magnet, and beneath it a mercury cup into which dips a metallic point. When the electric current passes, the electro-magnet attracts the disk and breaks the contact with the mercury, the current ceases to pass, and the contact is restored, so that the disk is set in rapid motion, and may make from 400 to 440 vibrations per second. An intense sound is produced, which it is thought may be made sufficiently loud to serve as a fog signal.

According to a writer in *Nature*, some of the essential conditions of a true and perfectly reliable lightning conductor are commonly neglected. Among these essential conditions may be named ample dimension and unbroken continuity in the rod, free earth contacts and frequent examination by galvanometers of the condition of these to prove that there is no gradual impairment through the operation of chemical erosion; the employment of points enough to dominate all parts of the building; the addition of terminal points to the conductive system wherever any part of the structure comes near to the limited surface of a conical space—having the main point of the conductor for its height, and a breadth equal to twice the height of that point from the earth for the diameter of its base. Not the least of these conditions is the avoidance of all less elevated conducting divergences within striking distance of the conductor—in especial, such dangerous divergences of this character as gas pipes connecting with the general gas main, and therefore forming good earth contacts.

An idea of what free trade has done for England is shown in the decline of the silk industry more than one-half during the past twenty years, being driven out by the competition of the higher art of Germany and France. What protection has done for America is also shown in the growth of the silk industry from merely nothing, twenty years ago, to a position only third in the world's production at this time. The following table shows where silk is made:

France	$85,000,000
Germany	45,000,000
United States	35,000,900
Great Britain	25,000,000
Switzerland	18,000,000
Russia	16,000,000
Austria	12,000,000
Italy	15,000,000
Japan	5,000,000
Other countries	17,000,000
Grand total	$270,000,000

The daily reports of the bank clearings is the only ready means of showing the comparative importance of business centers, and these give the indication of monetary activity. But so far as they go they do indicate the fact that Chicago is rapidly taking a place second only to New York in the business and financial world. The clearings at each city on days named were:

Cities.	*Nov. 5.*	*Oct. 29.*
New York	$126,240,295	$166,267,676
Boston	12,460,354	11,954,539
Chicago	10,197,000	8,608,009
Philadelphia	8,534,107	6,832,120
St. Louis	3,428,688	2,686,280
Baltimore	2,548,775	1,975,102
San Francisco	2,260,023	2,234,413
New Orleans	1.372,160	1,868,304

The Electric Light in the Navy.

WASHINGTON.—The Navy Department has received three of the new electric lights from France. Two have been placed on the United States steamship Trenton, and the other will be used at the torpedo station, Newport. It is likely that these lights will be adopted for general use in the navy.

Electric Wires.

REPORT OF THE FINANCE COMMITTEE OF THE BOARD OF ALDERMEN.

Alderman McLaughlin presented a resolution in the Board of Aldermen on October 10, providing for the appointment of a committee of three to inquire into the matter of telegraph, telephone, electric light, and other wires, and the danger they cause to persons in the streets, and especially to firemen in the discharge of their duties. The resolution was adopted, and the committee was also instructed to report on the authority under which the poles for the wires were erected. Subsequently the special committee was discharged and the whole matter was referred to the Finance Committee. At the meeting of the board on the 5th inst. the following report was presented :

That, in obedience to the instructions contained in the resolution, your committee have examined the question so far, at least, as it relates to the erection and use of poles for conducting wires by the several companies authorized to light the streets of the city by electric lights. This right or privilege has been granted to three different companies, viz : The Edison Electric Illuminating Company, of New York ; the United States Illuminating Company, of New York; and the Brush Electric Illuminating Company, of New York.

"The grant to each company contemplated the laying of the wires or conductors under ground, under such conditions 'as may be prescribed by his Honor the Mayor, the Controller, and the Commission of Public Works, who are now by law authorized to make provision for lighting the streets of the city,' and consequently, in the opinion of your committee, it is clearly within the power of the Common Council, should it deem it in the interest of the public to do so, to compel these companies to comply with this condition of their grants. Any doubt on this question is set at rest by the following stipulation, which is contained in each of the grants to the companies named :

"'Whenever at any time any permit shall be granted to open the streets, pavements, or sidewalks for the purpose of laying the tubes, wires, conductors, and insulators of the company a sum equal to one cent per lineal foot of street occupied under such permit shall be paid to the city.'

"The ordinance passed December 10 and approved December 11, 1878, and the permit granted to the New York Electric Lines Company April 10, 1883, are clearly permits under which the electric light companies, if so disposed, may comply with the condition in their respective grants quoted above.

"It may be contended, however, that the provision in the grants to these electric light companies contemplates obtaining the permission therein alluded to by each company separately, and that it would not be just to compel them to purchase the right to lay their wires and conductors under ground from the persons named in the ordinance of 1878, or the permit of 1883. To overcome this objection it may be well to authorize each electric light company to lay its own wires under ground, in order that no advantage may be taken of these companies if compelled to conform to the requirements of their grants, by the holders of the right obtained in 1878 and 1883. Each company will then have the option to lay its own wires under ground or enter into an agreement with those who already have the privilege to lay wires for conducting electricity under ground in the streets of this city.

"Your committee are very decidedly of the opinion that the time has arrived when prompt action by the Common Council is necessary to relieve our citizens from an evil that is daily increasing in proportions and that has already attained a growth that is most alarming. The loss of property by fire caused by the contact of electric conductors might be borne, as the loss may be made good and compensation given to the loser; but when the lives of our citizens are not only constantly menaced and endangered, but actually destroyed, by the action of the subtle agent that courses through the innumerable wires that, from unsightly and insecure wooden poles, traverse nearly every avenue, street, or public place within the corporate limits of the city, it is the imperative duty of the Common Council to interfere between our citizens and these electric illuminating companies and compel a compliance with the terms of their respective grants from the corporate authorities by requiring them to remove the poles and wires from our highways, and to lay their tubes, wires, conductors, and insulators beneath the surface of the streets, avenues, and public places in the city, according to the terms of the grants to these electric illuminating companies. a compliance with their conditions, in respect to laying their wires under ground will also be a source of considerable revenue to the city "

An ordinance embodying the points in the report accompanied it, and Alderman O'Neil moved its adoption. In doing so he referred to the number of accidents which had occurred recently, and pointed out the necessity for immediate action. Undue haste was deprecated by Alderman Kirk, it being a question in his mind if the board had the authority to compel the companies to place their wires under ground after it had given them permission to erect poles in the streets. Alderman Fitzpatrick suggested that it would be well to have the opinion of the Corporation Counsel on the proposed ordinance. Alderman Wells said that he thought that action should be taken without unnecessary delay, and suggested that the matter be made a special order for a week from next Wednesday. This was agreed to.

Telephonic News

Kansas City and Northwestern News.

KANSAS CITY, Mo , Dec. 1.

A disastrous fire occurred in this city on Wednesday, the 28th, and the telephone company suffered a loss of about $1,000. The building adjoining the exchange, a large wholesale drug establishment, was burned to the ground, and the heat of the flames melted the cables that passed in front. Four of them went down, as well as the guy wires. Strange to say, the chestnut poles stood the enormous strain without breaking, and as soon as the fire died down a temporary rope guy was placed, and the one-sided pressure removed. The work of splicing the cables commenced the next day, and by Monday of next week, General Superintendent Smith expects to have them all working. The fire was well handled, or the operating room would have been completely destroyed. As it was, the damage was all outside.

Fifty telephones were put in at Kansas City during the month of November.

Col. Clowry, General Superintendent of the Western Union, visited Kansas City this week. From here he went to Denver and Santa Fé on a tour of inspection.

C. D. Crandall, Secretary of the Missouri and Kansas Telephone Company, returned Tuesday from Chicago, where he and Mrs. Crandall were entertained by the Western Electric people, a supper attended by Prof. Elisha Gray, and a number of other electricians, being given in their honor.

Telephone stocks, after a depression of a few months, are again looking up in the West. There will be considerable activity in this line of stocks among the Western dealers this winter.

The material has been ordered for the construction of a toll line between Carrollton and Norborn, Mo., a distance of twelve miles.

BI-POLAR.

The Mexican Telephone Company.

Touching the reported sale of the right to take out patents for the Bell and Blake telephone apparatus in Mexico to the Mexican Central Telephone and Telegraph Company, and the statement that the Mexican Telephone Company declined to purchase the same on the ground that said rights were considered valueless, a party interested on the subject says that Central has the opinion of eminent counsel in the United States and Mexico, that prior use does not invalidate the inventors' rights in the latter country, and the good-will alone carries with it the royalties due the inventors from the American Bell Company, amounting to $1.50 on every instrument exported to Mexico. The Central company had, it is claimed, Oct. 1 over 260 subscribers in connection with its four exchanges, and has applications for many more. In its territory there are five cities of over 50,000 inhabitants, three of over 20,000, and seven of from 5,000 to 10,000, and in all eighteen to twenty of sufficient size to warrant telephone exchanges. The Mexican Central, the Mexican National and the Mexican Oriental, Inter-oceanic and International railroads pass through and connect their chief cities, and whatever growth awaits Mexico will naturally take place along the route of these lines—especially on the Mexican Central. During August and September, 1883, sixty-nine subscribers were added to the four exchanges in Guanaguato, San Louis Potosi, Zacatecas and Leon. In August the calls for connection were 12,488, and in September reached 19,916. About $30,000 has thus far been expended in plant by this company.

The Missouri and Kansas Telephone Company have averaged twenty-five subscribers per week since July last.

A new telephone exchange has been started in South Wales, which groups together Swansea, Cardiff, Newport, and Ebby Vale, a distance of between eighty and ninety miles. They also join a station at the Mumbles Head.

The Tropical Telephone Company have just shipped four hundred sets of instruments, complete, to Buenos Ayres.

Libel by Telephone.

A curious case has recently occurred in Hamburg, in which the manager of a branch establishment sues his employer for libel by telephone. The manager pretended that he did not hear the message, and obtained a witness to receive the second edition; but as telephone messages can be heard by others than those they are intended for, it is considered that a libel spoken through the telephone is "published," hence the action, the result of which is not without interest to a good many.

Mr. C. D. Huntington sailed from New York in the steamship City of Puebla last Thursday. He goes back to Mexico in the interest of the firm of Delano, Haines & Co.

Mr. E. T. Gilliland will open his new experimental shop in Boston this week.

Major Geo. W. La Rue, representing the firm of Delano, Haines & Co. in the City of Mexico, has just returned, and will remain in this city.

The New England Telephone and Telegraph Co., formerly the Bay State, Boston & Northern, Suburban and National Bell of Maine, held a meeting at their office, 40 Pearl Street, Boston, Mass., on Nov. 21, to consider the idea of dividing New England into six sections. A plan being agreed upon, the following superintendents were appointed: John T. Wheeler, General Superintendent; Col. Plympton, of Boston; Mr. Daboll, of Springfield; Mr. Hunt, of Greenfield; Mr. Smith, of Salem; Mr. W. H. Black, of Worcester, Mass., and Mr. Farnham, of Portland, Me., division superintendents. Mr. Black, formerly cashier of the Bay State Telegraph Co., has one of the largest territories, including South Framingham, Worcester, Clinton, Fitchburg, Lowell and Marlboro, Mass.; Nashua, Manchester and Concord, N. H., and other important places. The new appointments are considered good.

The net output of the Bell Telephone Company for the month ending Nov. 20, was 3,811 telephones, against 3,706 in October, and 5,033 in November of last year.

Since our last report the work of extending the telephone lines throughout the territory operated by the Pennsylvania Telephone Company has been pushed forward with remarkable energy and success. In order to give an idea of the manner in which the work is progressing we give the work of one day, which was done by the construction gang consisting of thirteen men: They dug the holes and planted fifty poles, strung nine miles of wire, and put up two sets of instruments. This same gang is at present constructing a line from York to Hanover.

The territory lately operated by the Hanover Telephone Exchange, including the town of Hanover and surrounding country, has, during the past month, been acquired by the Pennsylvania Telephone Company, and now a trunk line is being constructed connecting Hanover with York.

Hanover will be made the central point for a number of surrounding towns and villages, among which is Gettysburg, Littlestown, New Oxford, McSherrystown, East Berlin—all these points will be connected with the outside world through Hanover and York exchanges. The business interest of these places will be greatly enhanced by these telephone facilities, and the business men who take hold and control the lines from the outstart will derive the greatest benefit. They are also getting in at much lower rates, now that the construction gang is in their neighborhood, than after the exchange is fully established at Hanover.

The work is also progressing rapidly at other points. During the last month Strausburg and other points in Lancaster county have been connected, as well as towns in other counties in the territory.

An active work is also being pushed forward in the counties in the State of New Jersey which are under the control of the Pennsylvania Telephone Company; and by our next issue we expect to give a full report of the new lines in that section of the territory.

From the interest exhibited by the business men of the smaller towns and villages throughout the counties controlled by the Pennsylvania Telephone Company the work of extending telephone wires has just commenced, and the indications are that the business of the company next year will be immense.

The first year of the history of the company will close on the last day of 1883, and the first year's work, so far as rapid growth in business, economical management and large dividends are concerned, places it at the head of telephone companies in America, and distinguishes Mr. Wm. Ker as an able general manager.—*The Telephone, York, Pa.*

The firm of Delano, Haines & Co dissolved December 1st. Mr. J. D. Haines will be identified with the Time Telegraph Company, and Mr. F. M. Delano will carry on the business formerly conducted by the firm.

Mr. Harry Thayer, the courteous and popular manager of the Western Electric Co. here, returned to Chicago yesterday, to resume his former position as manager of the company there. Mr. Thayer has made many warm personal friends during his brief stay here, who will sincerely regret his return to Chicago. Both his company and himself certainly have reason to be proud of his business management, and the excellent impression he has made among the telephone people in the East while here, and it is probable he will soon return.

By an ingenious automatic contrivance, telephone subscribers in Boston are furnished with Harvard Observatory time every minute, whenever they choose to listen at their receiver. Suppose the time to be 11.39, the listener will hear eleven clicks given slowly, then three, and then nine more slowly, with short intervals after each series. When the minute hand is exactly upon the point there is a short buzzing sound, in order to fix the time with precision.—*New York Sun.*

Mr. C. A. Brown, the well-known manager of the Western Electric Company, recently of the Chicago office, has returned to take the same position formerly held by him here. His friends will welcome his return to New York.

The Telephone in Glasgow.

The telephone exchange system has undergone very great extension in Glasgow within the past couple of years. In the month of March, 1881, the different interests then existing were amalgamated in the National Telephone Company; and whereas there were at that time 290 exchange subscribers, there are now 650 exchange and 200 private lines. There are now no fewer than six exchanges—one each in Queen street, St. Vincent street, Douglass street, Morrison street, (south side), Hillhead, and Bridgeton; and all of them are connected together by means of trunk wires. The first-named exchange is the principal one, there being in all about 400 subscribers connected with it. There are eight switchboards in it, each of which affords communication with fifty subscribers, and all the boards are intercommunicated, so that a subscriber in one may be "connected up" with a subscriber in another. At each of the boards there are two operators, and nearly all of them are young ladies. There is no ringing of bells, or anything of that kind; but when a subscriber calls a small disk falls down which at once attracts the attention of the operator. All the exchanges are open night and day, in which respect they are in advance of the telephone exchanges in London; and communication can be had with Edinburgh and Leith, Greenock and Paisley, by means of trunk lines; and with the Ambulance Association, the infirmaries, most of the public buildings, and many warehouses, offices, and public works. It is specially worthy of remark that there are many private lines from Glasgow to places at distances of ten, twenty, or even thirty miles beyond the boundaries. Further, it is interesting to notice that each subscriber on the average calls up another five times a day, and allowing for five replies, each telephone is used ten times a day; but some subscribers use their telephones fifty or sixty times daily. As many as 4,000 connections are sometimes made in one day. The National Telephone Company have now obtained a concession from the Postmaster-General by which a reduced tariff can be charged for intercommunication between the large towns and cities and Glasgow.—*Engineering.*

Spirits at the Telephone.

The suggestion frequently made that the sensitiveness of the telephone rendered it available for spirit manifestation, and hence might possibly be used for transmitting communications from unseen operators, appears to have been acted upon by some one or more of the spirit-host at Saratoga, N. Y., in two instances, the last of which occurred last spring at the time of the decease of Dr. L. B. Larkin, during whose illness the occasional ringing of the call-bell of the telephone in his house caused him so much annoyance that it was disconnected, and so fixed as to prevent all use of it. The morning that Dr. Larkin died, says the *Sentinel*, the call-bell of the telephone of Mr. R. C. Vandenburg, in another portion of the village, was rung, and when a domestic went to see what was wanted, this message came: "Dr. Larkin died this morning [giving the hour]. Let Mr. Vandenburg come here at once." Then the girl was asked to repeat the message to show that she understood it. When Mr. Vandenburg came in he was informed of the message, and at once went to Dr. Larkin's place and told them he had come in response to it. He was told that they had sent no message nor authorized any, and he was shown the disabled instrument. His services, however, were thankfully accepted in making arrangements for the funeral. Then attempts were made to ascertain where the message originated, but without the mystery being at all unraveled. The authority above mentioned further says that the late Dr. Larkin was a firm believer in spiritualism, and the friends believe that the message to Mr. Vandenburg was sent by some spirit friend who found a medium near the wire at some point, and believed Mr. Vandenburg's services would be needed in making arrangements for the funeral, as indeed they were.—*Exchange.*

Lowell and the Telephone.

For the past six months the clearings of the Lowell clearing-house have been from $800,000 to $1,000,000 less than for the same period last year. This is owing to the fact that the telephone transactions and purchases which were so numerous for the past four years have ceased, principally because all the available and valuable territory that could be purchased has been secured. The amount of business transacted by the Lowell syndicate during their existence as a syndicate for four years past, has been enormous, and at present is represented by several companies with a apital exceeding twelve millions of dollars,

with a market value to-day of some nine millions. At one time nearly four-fifths of this capital was held in this city, among some four hundred shareholders. The stock has now been scattered, and is now held by some three thousand stockholders, mostly in various parts of New England and New York. This capital is distributed in about six companies, who have an earning power of something over a million and a half per annum. There are in this combination 25,000 subscribers, operating as many miles of exchange wire and several thousand miles of wire connecting cities and towns, transmitting over 40,000 messages per month.

Lowell has been the leading telephone city of the world, and has done more to advance the wonderful invention financially and otherwise than any other city; residents of this city at one time managing one-fifth of the entire telephone business of the United States. As a large amount of capital has been invested by residents of Lowell, a large share of the profits of the business has been made by them, making extensive fortunes for several, and giving to a larger number handsome returns for their investment, even if they should dispose of their stock at the low market price of to-day. A great many of our business men have been afraid of telephone investments, and have lost no opportunity to say the whole thing was an "air ship;" and to-day, on account of the low prices of the stock, they still more firmly believe, as it is expressed, that "the thing is up." Notwithstanding this, however, the companies go on paying their usual dividends and present to the public their regular reports, prepared by auditors of unquestionable character and ability, showing that the companies earn the dividends they pay, and more, too. While this continues the masses will believe, as they have heretofore, in this security as a good one.

There seems to be no end to the increase of subscribers, there being added in Lowell as many per month as two years ago, notwithstanding there are one thousand in the city. The same is true of other cities, and in many places in the southwest, where the telephone has never been introduced. Places the size of Manchester or Nashua start off with 200 to 300 stations, and in a number of places the company has received a bonus to start an exchange. The business never was in a better condition, and the stock is fifty per cent. cheaper to-day at the market prices, with the large increase of business, than it was months ago when the stock was originally placed by the syndicate.

The recent fall in the prices of these securities cannot be accounted for by the managers, unless it is by reason of the general shaky times and want of general confidence, and the pending lawsuits against the American Bell Company, or in which they are the plaintiffs, as in all cases where the matter of invention is at stake. The suit with the Western Union Telegraph Company is one to determine whether the Bell Company shall pay the Western Union certain proportions of the royalty the American Bell receive from the stock they hold in other exchanges or companies—the thirty and fifty per cent. on the stock as the case may be. This is brought about on account of the contract between the Western Union and the American Bell, which was made a few years ago, whereby the American Bell agreed to give the Western Union a certain part of their receipts if the Western Union would withdraw from the telephone field. There is no question if the American Bell are the losers of any suit, but what a compromise would be effected upon a satisfactory basis, as there is too much capital at stake, back of which stands the American Bell, and also upon which the American Bell depends, to allow any of their business to suffer the effects of competition.

Then again, the companies in which the American Bell have no stock, such as the Erie, and others, in the event of a new telephone coming into the field, could adopt the instrument they saw fit, and in case of competition we see no reason why the telephone business now in possession of the field would not stand as good a chance to live, as two railways running to one town, or any other business where there is competition.

As before stated, the stocks of the telephone companies are decidedly low and cheap: the American Bell, a twelve per cent. stock with a great future, sells for 191 and 194; the new New England, although not fairly on the market and a six per cent. stock, is offered at sixty and sixty-five dollars per share; the Erie Company, covering the States of Texas, Arkansas, Minnesota, a part of Wisconsin, the territory of Dakota, and the city of Cleveland, Ohio, and the surrounding territories, numbering over 7,600 subscribers and paying quarterly dividends of one and one quarter per cent., sells for forty-four and forty-five dollars per share, which makes the dividend over ten per cent. on the investment. Of course these local stocks are more or less affected by the rise and fall of the stock of the parent company, although they do not all depend on that company, as before stated.

The business has now been established among us for the past five years, one of our local companies having paid nineteen quarterly dividends, varying from one and one-quarter to four per cent., thereby showing that the business has come to stay, and we see no reason why these stocks should not stand as well as any of the solid stocks, and sell for a price nearer their real value. There has certainly nothing happened adverse to this business for the past year, though the stocks have fallen from ten to thirty per cent. The only remedy is a few more quarterly dividends and statements, and after the business has continued for another five years as it has for the last, it will certainly be entitled to a full recognition in all financial circles.—*Ed.*

W. E. Huntington, formerly Assistant General Superintendent of the American District Telegraph Company, returned to Mexico by steamer, Thursday, December 6th.

Charles K. Clark, late Superintendent of the Rochester District Telegraph Company, has been appointed to the Superintendency of the Manhattan District Telegraph Company, and took charge December first.

Cable Telegraphy.

According to recent trials of the speed of working on the Jay Gould cables laid across the Atlantic from Penzance to Canso, in Nova Scotia, 1,000 code words were sent from Penzance and received at the Canso station in 81 minutes, including all repetitions and corrections. The 1,000 words consisted of 87,288 letters, which is about equivalent to 1,458 words of 5 letters each, the average number for the English language. The above rate of transmission is therefore equal to 18 words of 5 letters per minute.

Mortgaged for Ten Millions.

The United Bankers' and Merchants' Telegraph companies, of New York, New Jersey, Pennsylvania, and Baltimore—in order to improve and extend their lines—have issued $10,000,000 of gold mortgage bonds. To secure the issue they have mortgaged their possessions to the Farmers' Loan and Trust Company as trustees. The bonds are of the denomination of $1,000 each and payable in 1904. They bear interest at six per cent. The trust mortgage was recorded at the Register's office.

PITTSBURGH.—The Standard Underground Cable Company have shipped to E. J. Smith, superintendent of the New York Fire Alarm Telegraph, some of the Waring cable, which will be put down on trial.

Underground Cables in France.

The laying of underground cables undertaken by the Ministry of Postes et Telegraphes in the East of France is now completed. The system in the North will not be finished until next year. 4,216 kilometers have now been laid in the whole of France, and there are 3,080 still to be laid to complete the entire system. The lines which are now already in full working order are those from Paris to Soissons, Paris to Lille, Paris to Nancy, and Paris to Dijon.

Telegraphing Without Arms.

At the school for telegraphy in Ann Arbor one of the students has not the use of his arms, yet he sends and receives messages all right. On the table in front of him is a pencil and a stick. Taking the pencil between his teeth he can write a good hand—if that is what one would call it—and with the stick in his mouth and resting on the key he can send messages at the rate of about 17 words per minute. His name is Manly Shotwell, of Concord, Jackson Co., Mich.

The District Messenger System of Boston.

There is probably no better evidence of the push and enterprise of the men who have in hand the work of adapting electric forces, to the convenience of the business community, than is to be seen in the organization and management of the various district messenger companies that are to be found in all the large cities and towns of commercial importance throughout the length and breadth of our country.

There is no character more familiar in our busy streets than the neatly-uniformed messenger boy, as a wit expressed it, "serene in the protection of a mysterious fate, and mud-proof in rubber leggings, threading his way through the densest jam of excited people with calm indifference and an ill-smelling cigarette." With his prompt response to the electric call, his time check and receipt, ready with quick service at all hours of the day or night, he has become a necessity of our modern rush of business habits.

Not only as a source of livelihood, but also as a school for teaching boys to be prompt in action and reliable in service, these messenger companies have been of immense service in reclaiming boys from the vices of the street, and starting them on successful and prosperous business careers. The time lost from school is far more than compensated for by teaching them those systematic habits and the desire for promotion to which all business men are indebted for their success.

Of the many messenger district companies now at work in this country, there are probably none to be found more thoroughly organized and systematically managed than the Mutual District Messenger Company of Boston, with its principal office in the old State House.

The following prominent citizens are the officers of this company: J. M. Prendergast, president; Parker C. Chandler, counsel; Allen S. Weeks, clerk and treasurer; D. J. Hern, general manager; and W. H. Smith, superintendent.

The remarkable success of this company is in no small measure due to the foresight and organizing ability of Mr. Hern. Starting himself from the ranks as a messenger boy in 1861 by steady gradations of promotion, he has reached the responsible position of superintendent for the Eastern division of the Mutual Union Telegraph Company—a position he still retains. It has been but a little over a year since he entered actively into the work of organizing his messenger boys, though for years he has been identified with and interested in them. By fair and intelligent treatment, there is a great deal of goodness and revenue to be coaxed out of them. The officers of this company have studied to elevate them in many ways, and believe they live up to a perfect system of civil service. When the boys enter their service, they are furnished a new 22-ounce mail agent's cloth suit, a full rubber suit, and new linen and shoes, if needed, at the exact price the cloth costs the company at wholesale. The integrity of the company is religiously strict upon the point that no one in their employ is allowed to make any profit whatever out of the purchases for messengers. This is well known to the boys, and has a most wholesome effect upon them. In some cases this is a source of great trouble with many companies, where the boys feel that they are being imposed upon by some of the officials taking advantage of their position, and trading at the expense of the poor boys. There is no principle of profit more fully settled than in establishing perfect and complete confidence between employer and employe. When first employed, the boys are paid four dollars a week for the first month, and the company requires ten hours' service per day, and pays them ten cents an hour for all extra work. The second month they are promoted to five dollars a week, and thence to a commission office, where they average about seven dollars a week; thence to the position of sergeant at thirty or thirty-five dollars per month. They have in their employ three hundred boys, with one sergeant to every twenty-five boys, whose duty it is to patrol the streets and keep the boys moving. They also visit the eighteen offices of the company, and help in various ways. In case of fires or other causes of street crowds, these sergeants go into the crowds to see that no boys are satisfying their curiosity at the expense of the company's customers. This simple, watchful care saves the company large sums of money in labor, and insures speed to their customers. So thorough and expeditious has been the work done by the Mutual District Messenger Company, that the Western Union Telegraph Company has been induced to give them a contract running for ten years, by which they give them the exclusive right to deliver and collect all their telegrams in Boston and vicinity.

To give some idea of the energy instilled into this company by Mr. Hern, it was only organized November 1st, 1882, and it made such rapid progress, and pushed all other district companies so hard, that their business was almost entirely transferred to this company at the end of sixty days. In May following negotiations were entered into looking to a consolidation with the American District Company, and on June 1st, 1883, both companies consolidated, with a capital of $250,000, and the stock is now quoted at par. A strong point in favor of the Mutual, and one that companies in other cities might take a good lesson from, is that the strength of the Mutual District Messenger Company in Boston lies in the fact that they are well known personally to the business men, and are on the most pleasant terms with roof-owners and officers of telephone and electric light companies, by means of which an exclusive exchange of roof fixtures is obtained. This saves a world of trouble in those petty wars and duplicate roof fixtures that are so annoying to the owners and occupants of houses, and is the most potent of all causes in raising enemies to aerial electric wires, and furnishes them with material for demanding laws to force the companies to put their wires underground in some cities.

The great trouble with the old companies has been cheapness in wages and fixtures, and giving and getting poor services in return, and general complaint and dissatisfaction all round, while the Boston Mutual has pursued the plan of paying their help well, furnishing their offices after the best modern style with mahogany and cheery furniture, and using the best supplies known to the business, thus guaranteeing the best possible services.

Another feature with this company is that it does a general business in addressing and delivering circulars and printed matter for out of town, as well as home customers. They make a special feature of this work. This system of delivering circulars on the street, wherever large numbers of business men accumulate, and at the homes of residents, has become one of the most popular methods of advertising, for thus any special class can be reached with promptness and certainty, the messenger being able to select from the crowd the persons most likely to need the article advertised.

Mr. D. I. Courtney can get mail matter by calling at the office of the REVIEW.

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Those desiring to recommend their goods can do so to any extent in our advertising columns, but we will not publish for pay anything of that nature in our reading columns.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

The Proprietors do not hold themselves responsible for opinions expressed by their correspondents.

No notice is taken of anonymous communications.

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NEW YORK, DECEMBER 13, 1883.

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The Boomerang Returns.

With gross injustice and a reckless disregard for facts, our contemporary, the *Times* began, some few weeks since an attack on the rivals of the Edison system. Truth and justice retired abashed into their respective temples while an unscrupulous journal, in the guise of a public censor, held up honest business men to the reproach of the community. The victims were carefully selected and shown no quarter. All sorts of false charges were made against them and the arc system of lighting. The ignorance of the public concerning electrical science was taken advantage of and the most ridiculous statements were made concerning the powers of electricity when used for arc lighting. It would run down streams of water and attack the firemen, though it had found in water a less resistance than in the human body. They didn't say that it would follow the firemen home to the bosom of their families and kill them as they crossed their own threshholds, but they inferred that it would do this. Indeed, from the testimony given in the suits which followed the articles in question, we learned for the first time that electricity had a peculiar affiliation for firemen.

Doubtless the reader observed that the purpose of the instigators of the articles in question was to arouse the fears of the firemen or some ignorant persons. Why, they reflected, do not the complainants, if their ardor in this cause is disinterested, stick to the scientific aspect of the arc wires as conductors or electric mains, and not address themselves so much to the fears of a class of the community which is incapable of discerning for itself? The reasons for this are not far to seek. It was desired that the firemen should refuse, in a body to serve, unless these arc wires were taken down, and the business men, who for the most part have neither the time nor the inclination to look into the subject themselves, be stampeded and demand the removal of the arc-light poles. But who was it that desired this result, and why?

Blackstone, in his world-famed "Commentaries" on the law, has told us that if we would discover the perpetrator of a crime, we must seek to find who would be benefited by its commission. Following this well-digested course of reasoning, we find that the Edison people would be benefitted, and would, if successful, perhaps be enabled to rid themselves of dangerous rivals.

It was not entirely conjecture that led us to suppose that they had an interested motive in the recent proceedings, we think that other and more cogent reasons were apparent.

Singularly enough, ever since the charge was made against the Edison company, now some four weeks ago, a series of facts have come to light, and that has taken place which, when summed up, is well nigh a complete corroboration of the position the REVIEW took at the start.

To be sure, the president of the Edison Company has said, "I can assure you our company did not organize any attack on the voltaic arc system." Mark his words well; how diplomatically, how ingeniously constructed is this sentence! This has a genuine smack of Eastern diplomacy in it that is refreshing. The diplomats of the Sublime Porte, it is said, always maintain a dignified silence, a stiff upper lip, as we are wont to term it, in our Western vernacular. In other words the diplomat of the Orient never gives himself away. He wears an expression in which childish simplicity and unadulterated virtue commingle in a very plethora of guilelessness. But it is this very amplitude that excites suspicion in the breast of those who best know him, for it is on such occasions when he may be said to be up to his most dangerous schemes, and when he beams most kindly on the Christian with his oleaginous, saponaceous smile, that he is most to be dreaded.

Now, in tracing the characteristics of the Turkish diplomat, we do not wish to be understood as finding a complete analogy with the president of the Edison Company, because we are sure that the latter would not say what is untrue, and the child of the Sublime Porte is notorious for the contrary characteristic.

Thus, when the president of the Edison Company says that his company did not "organize" any attack on competing companies, we believe him—the testimony given before Judge Ingraham to the contrary notwithstanding.

We say we do not believe, and we never charged that the Edison Company "organized" an attack. But we will leave it to the intelligent reader, that if Mr. Eaton had said that neither himself, Mr. Edison, nor any other officer of his company, had made the unjust statements to a reporter of the *Times* in the guise of "an eminent electrician," it would have covered the ground more completely and have been consequently far more satisfactory. If John Smith should furnish a mob of reckless boys, at their suggestion, with a tin can, to be tied to the tail of an unoffending dog, he could truthfully declare that he did not organize the raid on the dog, but as the persecution that followed was indirectly caused by his act, he could hardly hold himself guiltless.

In the attack made by the *Times*, with the aid of the Edison Company, upon the chief rival of the latter, the accused company was not permitted to tell its side of the story, nor given an opportunity to refute the ridiculous accusations made against it. Only one side of the story was told, and that was the Edison side. By the absurd statements made against the rival company, the unthinking public was not unreasonably inclined to look upon the officers and employes of the latter as fiends going about seeking whom they might destroy—soulless, implacable, cunning.

Fortunately for them, however, and fortunately for the cause of truth and justice, the wheels of the gods, though they grind slowly, grind surely and effectively. Like the recoil of the boomerang, the weapon so relentlessly aimed at the innocent has recoiled and rebounded, and we will venture to predict that the result of the late attack will prove more disastrous to those who assisted it, even if they did not organize it, than to those against whom it was directed.

We suggested to our contemporary, when it first went into this crusade, that it would be as well to get the other side of the story; but it would have none of it. There was no other side, in its opinion. The fact is, our contemporary did not know it was assisting one company to strike a blow in the dark and under the belt at a dangerous rival. More strictly speaking, it did not know that the Brush Company had a storage battery system for incandescence lighting, and that the electrical energy was to be supplied by these arc wires which now run through the streets; it did not know that the Edison system was primarily an underground system. It did not think to ask the Edison Company why it had remained quiet so long—for years; at a period, too, when the arc system, not yet perfected, was far more dangerous in the way mentioned than at present.

Our contemporary is taking the same one-sided stand, at the present moment, in a case which involves the authenticity of the Cypriote collection in the Metropolitan Museum of Art. It has always shown itself an implacable enemy of Di Cesnola, the defendant in the present suit; it has repeatedly declared him an arrant fraud and humbug, and we must confess it has had ample reason to do so. But now that the case is being considered before the courts, and the man is trying to defend himself against what seems to be overpowering odds, it is the height of injustice to permit its reporter of the proceedings to give his valueless opinions to the disparagement of the accused—to say that he looks dejected, beaten and demoralized. This is not fair play; this is persecution—it is the exultation of the victor over the vanquished, and is both cowardly and un-American.

But when the *Times* strikes in this manner at the voltaic arc light companies, it takes up a contract that it will find no easy matter to carry out. These are no friendless adventurers; these no defenceless culprits. They are composed of men of integrity, intelligence and backbone. They have put large sums of money into what they believe, and what has shown itself, to be an efficient system of lighting, and no bugaboo can frighten them into putting up with persecution without a fight.

So let the *Times* and its allies call off their dogs, for, though it is possible they are in the right church, they are certainly in the wrong pew.

Let it be distinctly understood that the ELECTRICAL REVIEW is not taking up the cudgels for the Brush Company; the Brush Company is no more to it than any other reputable company. It is principle we are maintaining, and not companies. Whether the Brush, the United States or any other company gets the lead in popular favor it is precisely the same to the REVIEW, and will cause us to neither rejoice nor lament. The ELECTRICAL REEIEW is for an open field and no favor, and can afford to look on unmoved, reserving the right, in the interest of its patrons, to criticise the means employed by the contestants, and contenting itself with a commentary upon the result of the struggle.

The peculiarity of the suits at law, recently instituted and recently closed, consisted, as did the articles in our contemporary, the *Times*, in apparent attempts to exaggerate defects in the system complained of and to undervalue its virtues. The citing of extreme cases was a marked feature of the proceeedings.

There is a species of human being who will not admit in his enemy the possession of any redeeming qualities, and it was thus that the Voltaic Arc System was treated. It must, therefore, have been with not a little annoyance, that the prosecutors of this raid on the Voltaic Arc System contemplated the effect that the tardy but effectual evidence presented by the defense would have on that public which for a short period they had so successfully hoodwinked.

Let us turn for a moment to this testimony given for the most part, not by amateur electricians interested in the matter at issue, but by men who have made a study of the subject for years, and are known in the community as authorities.

Prof. Henry Morton, of the Stevens Institute of Technology, averred that he was in the employment of the Board of Fire Underwriters of the city, he assisted in the preparation of certain requirements or precautions, which, being followed, rendered the use of powerful electric currents as harmless as the use of any other sources of light. In his opinion fire has not been caused, and life has not been destroyed by currents used in accordance with those requirements. With respect to the transmission of electro-motive force over aerial structures or underground, he could not see that one method was to be preferred over the other, and if there were any risk it was more likely to result from the "grounding" of wires beneath the surface of the street than of those above. Prof. Morton averred that the statements in the affidavits of Messrs. Evans, Cheever, Clark, and Johnson, made for the plaintiff, were in great part false and misleading. Experience and study have taught him, he said, that there is no means of placing and efficiently using wires underground in this city. In Paris and some other foreign cities the sewers afford such a means, but here only a few lamps could be fed by an arc light current carried underground, unless costly sub-ways, in which the wires could be easily reached, were constructed. In his opinion, also, the almost constant tearing up of the streets would be a greater nuisance than is caused by the aerial wires. As to the Edison underground system, Prof. Morton stated that he was informed that it was not successful, and his opinion, based on that information, was strengthened by the fact that recently the Edison Company had begun to use wires overhead. He considered that there was little more danger from arc light currents than from incandescent light currents, and he declared that several of the fires spoken of by the *Times* of November 18, as having

been caused by electric wires, were caused by the underground wires of the Edison Company. As proof of the danger from improperly insulated wires underground, he said that he had a photograph of a piece of gas-pipe that had been fused by the Edison electric current, which had also ignited the gas and thus set fire to a building. Electric wires placed underground might, and probably would, lead to the ignition and explosion of confined gases, and thus cause disaster to life and property, such as could not result from aerial currents.

Thus, as is seen, the same faults which the Edison Company find in the Voltaic Arc system will lie against their own underground incandescence system, and indeed, Prof. Morton says, that they are more applicable to that system. It will cause fires, is dangerous therefore to life, and will explode gas, which the Voltaic Arc system, when arranged in accordance with the rules laid down by the Board of Fire Underwriters, is not more likely to do than are occasional defective chimneys, flues, and gas-pipes.

The affidavit of Prof. Morton concludes: "The fatal accidents alluded to in the plaintiff's affidavits and newspaper accounts relate, for the most part, to a time in the early history of the business, when both apparatus and circuits were carelessly erected and without proper regard to safety, and in every instance, so far as I can ascertain from careful investigation, the accident has resulted from total disregard of the precautions required by the Underwriters' rules, or from such carelessness of an employe or a user of the apparatus as would lead to fatal results with any form of apparatus capable of producing them—such, for instance, as a steam engine or a kerosene lamp. The hypothetical dangers considered by the writer of the newspaper articles, such, for instance, as the risks run by firemen from directing streams of water upon arc light wires, seem to me too absurd to merit serious consideration, and their suggestion involves the assumption of great ignorance in regard to the laws of electricity on the part of the public, to whom these suggestions are addressed. * *

Where the Underwriters' requirements are complied with in erecting aerial circuits, and the conditions of those requirements are continuously maintained, there is no danger to life or person from coming accidentally into contact with the circuit wires, even where the current used on the circuit is capable of producing fatal injury to a person exposed to its full force. I believe it to be practicable to maintain these conditions intact in the ordinary use of such circuits, and any derangement by which it would be rendered possible to divert a dangerous current through a person accidentally coming into contact—either directly or indirectly with the conductors forming the circuit—would involve contingencies too remote for practical consideration. The system used by the defendant is much safer, so far as concerns danger to life, than any of the other arc systems, since the electro-motive force or pressure of the current used is lower and the current is continuous and uniform in its character. Nearly, if not quite, all of the fatal accidents which have occurred have been produced by currents which were alternating or pulsating in their character and of very high intensity." The readers of the ELECTRICAL REVIEW here and abroad will see from this that each and every exception we took to the charges made by the *Times*, and which we reiterated *seriatim*, are sustained, by Prof. Morton. The arguments of the alarmists have not withstood the counter-assault of the expert testimony, and, as we said above, the weapons used to injure the business of a rival company have been so reversed that they are now, to all intents and purposes, directed toward those who brought them into the field.

Prof. Edwin J. Houston's affidavit contained the declaration that no practical method of conveying electrical currents of great intensity for long distances under ground has yet been devised, although it is probable that one will be in the near future. There was no danger, Prof. Houston averred, to be apprehended from aerial wires strung in accordance with the regulations of the Board of Underwriters of this city.

Frank L. Pope, an electrical engineer, averred that the statements of Engineer Evans were untrue, and that those in newspaper articles of an alarmist character, were inspired by the Edison Company, and made for its interest. He had heard of no harm having been done by the currents used by the United States Company. Mr. Pope denied that a powerful current of electricity diverted from a wire would follow a stream of water to the nozzle of a pipe, and thence be communicated to a fireman holding the nozzle, and so do him harm. On the contrary, the current would follow the stream to the earth. He also said that there was no good system of underground insulation. He also cited the cases of persons who had received shocks, and not been much hurt.

As Prof. Houston very truly says, no practical method for conveying electrical currents of great intensity underground has yet been devised. When such a system shall be developed, it will find us amongst its heartiest supporters.

Charles J. Kaiser, in his affidavit, swore that he had been shocked by the current, but had soon recovered from the excitement caused by it. In his opinion, however, the intermittent current of the Brush system would cause injury.

Several affidavits made by detectives contained the statement that one James Russell had told the affiants that he was employed by Thomas A. Edison to procure suits to be brought against the United States Company. President Eugene T. Lynch, of that company, swore that electric lights have cleared the moral atmosphere of New York to a large extent, and have proved an efficient aid to the police. He swore that the poles in Forty-third street are not merely to support wires, but are for lamps, wherever lamps are required. He gave a history of the litigations his company has recently undergone, and declared that the suits were inspired by the Edison Company. He also averred that no injury can be caused by the current used by his company.

The argument on the case was as to the technical right of the defendant company to use the street at all, and, if it has that right, as to whether it can use poles for supporting wires without lamps, or is bound to run its wires underground, and carry them to lamps through the centers of posts. Mr. Lowrey contended that, if the company is privileged to enter the street, the duty is put on it to lay its wires beneath the surface, where they will be least likely to do harm. The mere presence of the poles in the thoroughfares, he insisted, was a closing of the streets *pro tanto*. He called on the court to impound the affidavits for the defendant charging a conspiracy in which Mr. Edison was the principal. He said the defendant had not dared to charge that the present suit was a result of that alleged conspiracy, but he wished Mr. Edison to have the affiants indicted for perjury, or, in the interest of justice, he wished an action for conspiracy to be begun against that gentleman.

As said before, we don't believe a word of this conspiracy business, and are satisfied that there is not a word of truth in it. In our estimation, neither Mr. Edison nor Mr. Eaton would take part in, nor countenance, such a proceeding.

At the same time, we must confess that their method of opposing a rival company is not such as will commend itself to the electrical field generally.

Trying an Electric Motor.

The Daft Motor has been tried, and those who assisted in this somewhat perilous undertaking are now engaged in pushing the dents out of their hats, working their knee-joints, straightening their umbrellas and having new seats fitted to their trousers.

On their return to this city from Saratoga, they must have been mistaken by the train hands for wandering geologists, for they carried, profusely scattered over their persons, samples of various formations, varying from the azoic up to the lower members of the carboniferous. One gentleman had tertiary deposits of the Pliocene period extending from his shoulder up to his ear, which latter member had been made a depository for material from a miocene bed; while another carried a somewhat profuse supply of the red mud of a considerably later period upon that portion of the body on which he is accustomed to seat himself. Others would seem to have gone much further, bearing with them abundant evidence that they had explored such genera and sub genera as the iocene, upper and lower cretaceous, upper and lower jurassic, trias, permian, devonian and silurian.

Thus it would seem that if the exhibition did not prove a success from an electrical standpoint, it made ample amends from a geological.

It was on the down grade—70 feet to the mile—that the passengers made the discovery that the car was trying to go faster than the electric-motor in front of it, and while pondering upon this absurd conduct on the part of the car, the motor left the track for a ditch, and they realized how uncertain are the affairs of this world. Transforming themselves into an astronomical association, they saw, though it was yet broad day, myriads of stars start from their spheres and dart through the heavens.

No sooner had the members of the expedition been extricated from the geological formations of the surrounding country, and had lifted each other from under the innermost recesses of their tall hats, the brims of which had, in some instances, got down so as to rest on their shoulders, than two of the party, well pleased with this method of electrical locomotion, instantly gave Mr. Daft a contract for the building of two of his electrical motors.

It is not right, of course, to impugn the motives of these two gentlemen. It is possible that they really believe that this description of travel will prove profitable in the particular district which they represent. But they must not be offended if a certain portion of the public believe that there is a deep-laid plan behind the purchase of these Daft Electrical Motors, that they see their way clear to get rid of plumbers, book agents, and talkative barbers by giving them free passes on the road they are about to operate.

Seriously, Mr. Daft's motor has much to commend it, but his trial trip shows plainly what the merest tyro in motor engineering can see all along, viz: That one of its principal defects is lack of weight.

There is no better, no safer method of locomotion than by electricity, when applied to well-constructed motors, and we hope Mr. Daft will be able to reach the height of perfection in this construction that has already been attained both in France and England, where for at least a twelfth month electrical locomotion has been recognized as the very best description of locomotion for short lines of railways and tramways.

The Fabrications of the Daily Press.

Some time since our contemporary, the *Times*, discovered, through an interview with "an eminent electrician," that the arc light wires menaced the lives of man and beast, and, with the idea that it had a real sensation, which, in point of uniqueness, was far more startling than the ordinary murder cases filling its columns, set itself to work to paint its imaginative picture in the most vivid colors. The reporters getting their inspiration from the editors, knew no rest. A wire falling into the street from the arc light poles brought to their heated imaginations visions of men and animals, whom it had touched, falling prostrate, and the adjoining streets filled with ambulances to carry off the dead and dying. If the line men of a telegraph company got their wire entangled in the wheels of a carriage or truck, and horses and pedestrians stumbled over it, the occurrence would be heralded the following morning in the columns of the *Times* somewhat like this: "Death in the Air!" "An Electric Arc Wire Falls Across the Street!" "Horses Spring into the Air and Fall Lifeless!" "A Policeman tries to Break the Wire with his Club (wooden), and is Knocked Senseless, his Clothes being nearly Burned off from Him!"

"Father," exclaimed a lad to his paternal progenitor, "there's two million cats on our back fence!"

"My son," replied the sire, "you are surely mistaken; just think what a multitude of cats that would be."

"Well, there's one million."

"Come, now; not so many as that."

"Well," said the boy, upon second thought, "there's our cat and another cat."

Applying the same personal equation to the *Times'* reports as above, and allowing, as the astronomers would say, for parallax, refraction, semi-diameter and dip, we get the following:

Two telegraph linemen, while stringing a wire across Broadway, allowed it to slip out of their hands. Before it was picked up, two stage horses and a mule stumbled over it, and a policeman barked his shins.

We have investigated these blood-curdling accounts of the *Times*, and we wish we could stigmatize them simply as exaggerations, but candor compels us to say that in nearly every instance they proved either gross misrepresentations, with intent to alarm the public, or absolute fabrications made out of the whole cloth.

A single instance will suffice, at least for the present, for *falsus in uno, falsus in omnibus*.

A few days since an arc light wire fell from a post which had been run into by a runaway, in Fifth Avenue, near Thirty-fourth Street. The next day the *Times* said that the horse drawing a coupé, which passed on later, touched the wire, and received a shock which threw him to the ground, and from the effects of which he subsequently died. It said that several men received severe shocks from the wires, and a gentleman who assisted the occupant of the coupé to alight was badly hurt with the electricity coming from the wire on which the wheels of the vehicle rested.

The *Times* article stated that the arc wire fell of its own accord. This was to give the public to understand that, at any moment, one of these wires was likely to fall upon the heads of the passers bye. Then, it went on to say that the horse only brushed against the wire when he fell to the ground as if paralyzed. Many efforts were made to remove him, but, for some time, without avail, the horse in the mean time, still lying on the wire, was receiving the whole current from the electric main, through his body. Generous hearted men who tried to extricate the animal received shock after shock, and other such details *ad infinitum, ad nauseam usque*.

Many out of town papers, whose representatives here, took their cue from the *Times*, but without animus and with the single desire for a sensation, made all sorts of ridiculous assertions regarding this affair. The Boston *Evening Transcript*, which never lets an occasion for being assinine pass without taking advantage of it, said that three men had been killed by this accident, and no doubt, since Chicago is three times as far from New York as Boston is, they have it there that nine men were killed.

We state positively, after carefully examining into the matter, that no one was hurt.

But let us revisit the horse that, "terribly burned, was taken to a stable, where he died in agony."

This horse was not affected by electricity at all, but having fallen on the wire and got it caught under his flanks, was cut by it just as he might have been cut by a rope under the same circumstances. He is neither dead nor ill, but, on the contrary, is in good health.

To prove all this we append the following affidavits, to the perusal of which we would invite the attention of the *Times*, and other evilly disposed organizations and individuals:

NEW YORK, December 7, 1883.

Brush Electric Illuminating Company.

GENTLEMEN—My attention was called to a cab horse, on the 27th November, suffering from severe lacerations of the body, the result of struggling whilst down (and unable to rise) to free itself from an electric wire which had fallen to the ground. The horse was owned by the firm known as Overton & Hastings, 142 West 39th street. The theory of an electric shock received, in my opinion, is all nonsense.

Yours, &c.,
EDWARD LOOMES, V. S.,
134 West 39th street.

Alexander Lockhardt, member of the Royal College of Veterinary Surgeons, London.

VETERINARY INFIRMARY,
No. 124 East 13th street,
NEW YORK, Dec. 7, 1883.

This is to certify that I visited a brown gelding at Overton & Hastings' livery stable, West 39th street, on December 3d, and which animal was said to have been injured from the shock of coming in contact with a fallen electric wire From careful inquiry into the history of the case, I am of opinion that there is not the slightest foundation for the assertion that the horse was affected by electricity, and that all the wounds on the horse were produced by his getting entangled in the wires, and the same injuries are often seen by horses getting entangled in ropes.

The horse is now in my infirmary and doing well, and in a few days will be fit to work.

I have had a consultation on this case with Professors Robertson and Micheney, V. S., who both concur with me in my opinion.

ALEXANDER LOCKHARDT,
Veterinary Surgeon.

The Westinghouse Machine Company, of Pittsburgh, report a remarkable activity in the demand for their automatic engine. During the month of October they manufactured and shipped a total of seventy-three engines, representing a product of nearly $50,000. Their new orders during the same month aggregated over 2,000 horse power. Among the prominent orders were the New York & Brooklyn Electric Light Company, four engines of fifty horse-power each; the Arnoux Electric Light Company, of Cleveland, two of sixty-five horse-power; the Brush Electric Light & Power Company, of Savannah, two of fifty horse-power; the Butte Electric Light Company, Butte, Montana, two of fifty horse-power; the Brush-Swan Electric Light Company, of Cheyenne, sixty-five horse-power; the Brush Electric Light Company, of Buffalo, fifty horse-power; the Electric Light Company of Decatur, Ill., fifty horse-power.

Telephone Stock Quotations.

American Bell Telephone Company	194
Central New York Telephone and Telegraph Company	103
Empire State Telephone and Telegraph Company	205
Hudson River Telephone and Telegraph Company	105
New York and New Jersey Telephone Company	85
Mexican Telephone Company	3¾
New York and Pennsylvania Telephone Company	80
Southern Bell Telephone and Telegraph Company	130
Tropical Telephone Company	2½
Central Union Telephone Company	100
Iowa Union " "	100
Missouri and Kansas Telephone Co.	90
United Telephone Company (Kansas and Missouri)	89
Bell Telephone Company, of Missouri	165
Wisconsin Telephone Company	125
Cumberland Telephone Company	100
Great Southern Telephone Company	100
Michigan Telephone Company	105
Chicago Telephone Company	285
Erie Telephone Company	59
Union Telephone Company	100
Southern New England Telephone Company	178
New England Telephone Company	74

NEW PATENTS—ELECTRICAL—1883.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING DECEMBER 4, 1883.

289,411 Electric annunciator; Frederick Happersberger, Madison, Ind.

289,425 Electric light lantern; Wallace Goold Levison, Brooklyn, N. Y.

289,449 Insulator; Necter Rousseau, Chicago, Ill., assignor of one-half to James W. Brennan, same place.

289,456 Incandescent electric lamp; Robert J. Sheehy, New York, N. Y.

289,470 Electric burglar alarm; James Tomney, New York, N. Y.

289,471 Electric burglar alarm; James Tomney, New York, N. Y.

289,539 Telephone system; Charles Almon Jackson, Lawrence, Mass., assignor to D. F. Robinson, same place.

289,540 Electric motor; Charles Almon Jackson, Lawrence, Mass., assignor of one-half to D. F. Robinson, same place.

289,541 Electric motor; Charles Almon Jackson, Lawrence, Mass., assignor of one half to D. F. Robinson, same place.

289,552 Electric annunciator; Augustus C. Palmer, Utica, N. Y.

289,575 Telegraph wire; Thos. Shaw, Newark, N. J.

289,580 Safety device for electric arc lamps; Elihu Thomson, New Britain, assignor to the Thomson-Houston Electric Company, of Connecticut.

289,590 Electric lighting apparatus; Nelson S. White, Canton, Mass.

289,629 Lightning arrester; Josiah W. Dyer, Philadelphia, Pa., assignor to the Automatic Current Protector and Electric Manufacturing Co.

289,630 Circuit breaker and lightning arrester for electric currents; Josiah W. Dyer, Philadelphia, Pa., assignor to the Automatic Current Protector and Electric Manufacturing Co.

289,631 Thermo-electric battery; Asahel K. Eaton, Brooklyn, N. Y.

289,665 Circuit closer for burglar alarms; James L. Laselle, Jersey City, N. J.

289,725 Electric conductor; Sumner Taintor, Washington, D. C.

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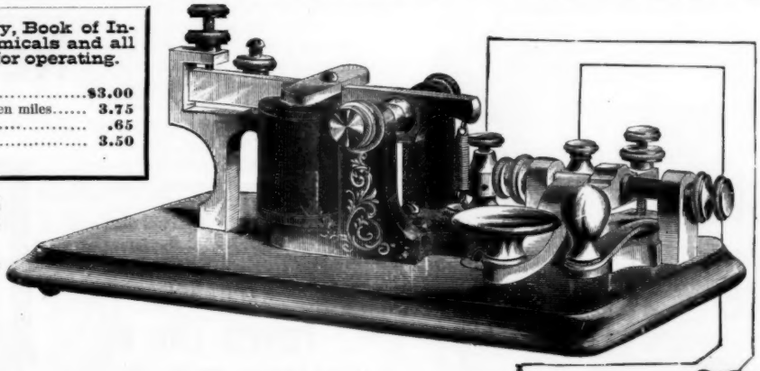

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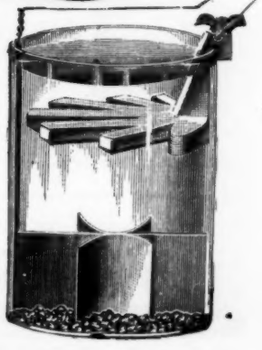

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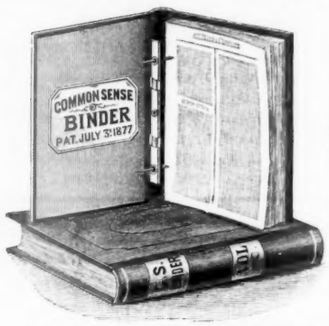

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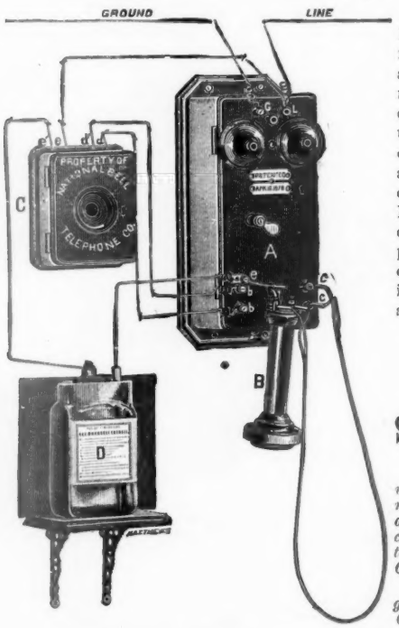

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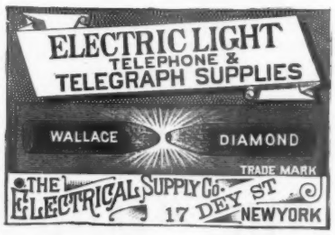

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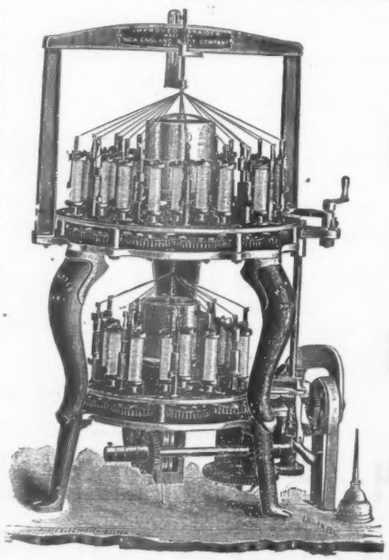

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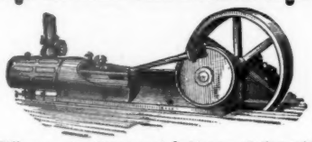

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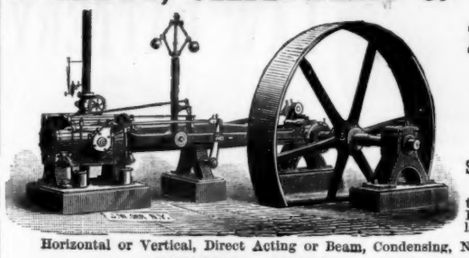

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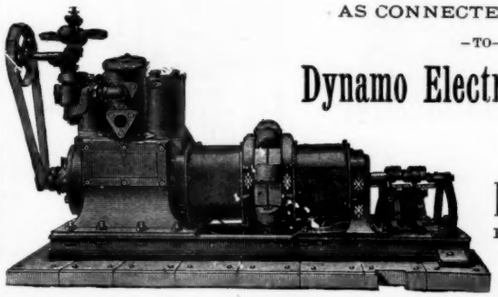

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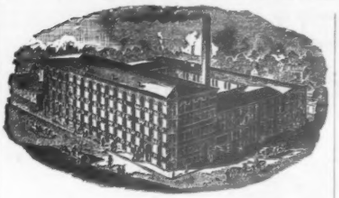

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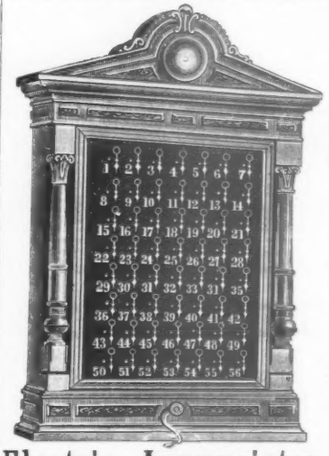

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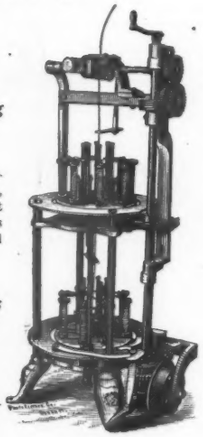

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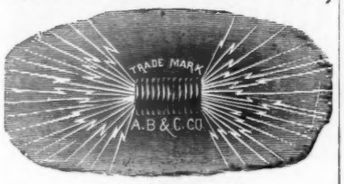

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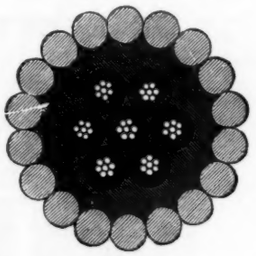

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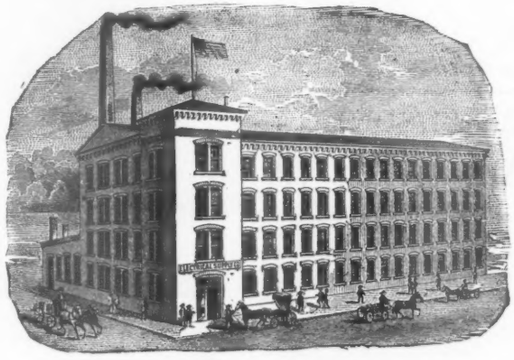

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7	30	1,200	15
8	64	1,200	35

Prices of machines and lamps same as the regular list. Our agents will give you estimates. We shall commence this month the shipment of **BRUSH STORAGE BATTERIES** to fill the large orders which have accumulated on our books. We desire to state that these batteries are **GUARANTEED** by this Company, just as all apparatus hitherto sold by us has been; and that the statements of our opponents regarding them, which have been so industriously circulated of late, are false in every particular.

THE BRUSH ELECTRIC CO., No. 379 EUCLID AVE., CLEVELAND, OHIO.

INCANDESCENT LIGHTS

SWAN INCANDESCENT ELECTRIC LIGHT CO.

OWNERS OF THE

SWAN PATENTS FOR THE UNITED STATES,

ARE PREPARED TO GRANT LICENSES TO COMPANIES TO SELL AND USE THE SWAN INCANDESCENT LAMP, INCLUDING OUR PATENTED HOLDERS, SWITCHES, CUT-OFFS, ETC. WE GUARANTEE OUR LAMP AND TO DEFEND THE VALIDITY OF OUR PATENTS. FOR TERMS OR INFORMATION, APPLY TO

THE SWAN INCANDESCENT ELECTRIC LIGHT CO.,

253 Broadway, Cor. 14th Street, New York